



Nutrient Management in Young Walnut Orchards

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Young Orchards Meeting, 1/16/15



University of California

Agriculture and Natural Resources | Cooperative Extension

To Know Where to
Go, Need to Know
Where You Start



Check Your Soils Test

- Most young orchards only need N
- Low P: 10-20 ppm $\text{PO}_4\text{-P}$
- Low K: <150 ppm
- <http://apps.cdfa.ca.gov/frep/docs/Guidelines.html>





CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE
INSPECTION SERVICES DIVISION


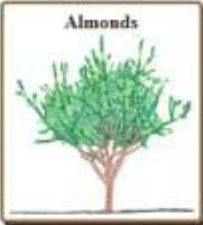





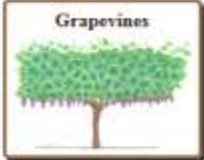
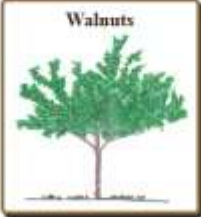





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Fertilization Guidelines for Major Crops Grown in California

These guidelines are based on research results from studies carried out in California and elsewhere. For an optimal fertilization program, site-specific information on soil type, climate and crop management need also to be take in into account.

After choosing a crop from the list below, detailed information can be accessed by moving the mouse over any shape with the symbol ⓘ.

 <p>Cotton</p>	 <p>Almonds</p>	 <p>Processing Tomatoes</p>	 <p>Corn</p>
 <p>Broccoli</p>	 <p>Lettuce</p>	 <p>Wheat</p>	 <p>Grapevines</p>
 <p>Walnuts</p>	 <p>Rice</p>	 <p>Alfalfa</p>	 <p>Strawberries</p>
 <p>Cauliflower</p>			 <p>Pistachio</p>

Developed in collaboration by



Soil and Plant Tissue Sampling

- [Soil Test Sampling Instructions](#)
- [Sampling for Soil Nitrate Determination](#)
- [Soil Sampling in Orchards](#)
- [Plant Tissue Sampling](#)

Additional Resources, Links

- [Organized by Topic](#)
- [Organized by Source](#)

New! [Nitrogen Partitioning and Seasonal Uptake Curves](#)

Google "CDFA FREP", → Crop Guidelines

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FERTILIZER RESEARCH AND EDUCATION PROGRAM

1220 N Street, Sacramento, CA 95814 • 916-900-5022 • Fax: 916-900-5245 • frp@cdfa.ca.gov

The Fertilizer Research and Education Program (FREP) funds and facilitates research to advance the environmentally safe and agronomically sound use and handling of fertilizing materials. FREP serves growers, agricultural supply and service professionals, extension personnel, public agencies, consultants, and other interested parties.

- ▶ [2014 FREP/WPHA Conference Presentations](#)
- ▶ [2015 Request for Concept Proposals — Due January 16, 2015](#)
- ▶ [Nitrogen Management Training Program for CCAs — Dates and registration info](#)

PROGRAM INFORMATION

- [FREP Fact Sheet](#)
- [New Initiatives](#)
- [Statutory Authority](#)
- [Fertilizer Inspection Advisory Board/Technical Advisory Subcommittee](#)

RESEARCH

- [Competitive Grant Program](#)
- [Grant Process](#)
- [Ongoing Research Projects](#)
- [Completed Research Projects](#)
- [Information for FREP Researchers](#)

TECHNICAL EDUCATION

- ▶ [FREP Research Database](#) - search over 20 years worth of research projects
- [Crop Fertilization Guidelines](#)

UPCOMING DATES

Jan 13-14, 2015: CDFA/UC Nitrogen Management Training for CA CCAs, Fresno

Feb 24-25, 2015: CDFA/UC Nitrogen Management Training for CA CCAs, San Luis Obispo

March 5-6, 2015: Western Nutrient Management Conference, Reno, NV

March 10-11, 2015: CDFA/UC Nitrogen Management Training for CA CCAs, Sacramento

QUICK LINKS

- [FREP Research Database](#)
- [Crop Fertilization Guidelines](#)
- [Annual Conference](#)
- [Competitive Grant Program](#)

MORE RESOURCES

- [American Society of Agronomy - California Chapter \(Cal-ASA\)](#)
- [Association of American Plant Food Control Officials \(AAPFCO\)](#)
- [California Certified Crop Adviser Program \(CaCCA\)](#)
- [California Department of Health Services - Division of Drinking Water and Environmental Management \(CDHS-DDWEM\)](#)
- [International Plant Nutrition Institute \(IPNI\)](#)
- [State Water Resources Control Board \(SWRCB\)](#)

The 4 R's of Plant Nutrition

- Apply the **Right Rate**
- Apply at the **Right Time**
- Apply in the **Right Place**
- Using the **Right Source**



Finish Line: Whole Tree N

	Dry Wt (Lbs/Tr)	N (Lbs/Tr)	% N
One year wood	12.9	0.13	1.01%
Branches	542	3.02	0.56%
Trunk	124.6	0.32	0.26%
Root Stump	123.9	0.31	0.25%
Roots	144.7	1.07	0.74%
TREE TOTAL	948.1	4.85	0.51%



*16 year old Hartleys, 50 trees/acre

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Apply at the Right Rate

- Match *Supply* w/ *Demand*
- Fertilizer + Water

N Application Rate*

Tree Age	Lbs / Acre	Lbs / Tree**
Year 1	10-20	0.2-0.3
Year 2	25-50	0.4-0.8
Year 3	50-100	0.8-1.5
Year 4	63-125	1-1.9
Year 5	75-150	1.2-2.3

*CDFA FREP Guidelines

**Assumes 65 trees/acre

Young Walnut N – Rough Rule

Year 1: 0.25 lb N/tree

Year 2 - Double it : 0.5 lbs N/tree

Year 3 - Double it : 1.0 lb N/tree

Year 4-6: Coast @ 1 lb/tree + 30-40 lbs/ton

Apply the Right Time



- Match w/ timing of tree demand, root uptake
- Trees take up nutrients when needed, not when applied*
- Mid-spring through summer
- **Avoid N after August**

*Unless they are slow release

Apply at the Right Place

- Delivery to active roots
- N moves w/ water
- Minimize movement below root zone
- Small, frequent applications



Apply the Right Source

- Little is known
- Be careful with liquid fertilizers, especially Year 1. Too much N at once can burn the roots.
- Granular is safer Year 1.



P – How low is too low?

Analite	Result	Units	Optimal	Very Low	Low	Normal	High	Very High
pH	7.3	SI	6.45					
Dist. Conductivity	0.7	mmhos/cm	1.00					
Soil Salts	426	ppm	572					
Water Nitrogen	2.0	ppm	35					
Chloride		meq	2.15					
Organic Matter		%	1.75					
Phosphorus (Dane Method)	14.0	ppm	28					
MicroNutrients								
Boron	0.7	ppm	0.6					
Zinc	0.6	ppm	12.0					
Iron	0.2	ppm	90					
Copper	2.0	ppm	8.0					
Manganese	0.9	ppm	35					
Sulfate	100.0	ppm	38.5					

	Exchangeable Calcium Result	Base Saturation		Acetate Extraction			Water Extraction		Extraction Rate
		Zinc S	Optimal S	Low	Normal	High	Result	% Total	
Phosphorus	277 ppm	28%	3-7				0.11 ppm	0.4	0.25%
Calcium	2211 ppm	83.4%	35-70				2.40 ppm	25.1	1.08%
Magnesium	1,407 ppm	42.8%	17-21				0.08 ppm	0.4	0.01%
Sulfur	79 ppm	1.2%	0.5-1				1.00 ppm	10.2	0.02%

- N usually only worry
- Depend on soil pH.
- Too low:
 - If pH < 7.0 → “Bray” <20 ppm PO₄-P
 - If pH > 6.5 → “Olsen” <10 ppm PO₄-P
- 4 lbs P / ton nuts, for Year 4+

P – How to correct, and how much?

- One dose of 25 lbs triple superphosphate per tree (11 lbs P_2O_5) on P-fixing soils lasts 5 years
- Apply in 6" trenches – not broadcast
- Trenches should be in sprinkler range, 2'+ away from the trunk
- Apply Fall or Winter



K – How low is too low?

Analyte	Est'd	Units	Deficit	Low	High
pH	7.3	SI	6.45		
Dist. Conductivity	0.7	mmhos/cm	1.00		
Sulfate Sulfate	425	ppm	672		
Nitrate Nitrogen	2.0	ppm	35		
Chloride		mg/l	275		
Organic Matter		%	1.75		
Phosphorus (Plant Avail)	14.0	ppm	25		
Microelements					
Boron	0.7	ppm	0.8		
Zinc	0.8	ppm	12.5		
Iron	0.2	ppm	90		
Copper	2.0	ppm	0.5		
Manganese	0.9	ppm	20		
Sulfate	100.0	ppm	58.5		

Plant Nutrient	Exchangeable Cation Result	Deep Solonchale Acetate Extraction			Water Extraction Rate#	Extraction Rate	
		Dist. S	Col. S	Low			
Phosphorus	277 ppm	2.8%	3.2%		2.31 ppm	0.8	475%
Calcium	2,911 ppm	58.4%	58.7%		2,403 ppm	28.1	105%
Magnesium	1,472 ppm	42.8%	42.2%		838 ppm	67.4	693%
Sulfate	79 ppm	1.2%	1.1%		1,301 ppm	89.2	10,62%

Plant Nutrient Recommendations

- N usually only worry
- Too low: <150 ppm K
- Be on look-out if sandy soil
- 12-25 lbs K per ton nuts, so consider some K in Year 4+

K – How to correct, and how much?

- Annual band application.
 - Sandy soils: 200-250 lbs K_2O /acre
 - Heavier soils: up to 900 lbs K_2O /acre
- Beware KCl. Cl can burn young roots. Potassium sulfate (K_2SO_4) is safer.
- Apply in fall to allow winter rains to move K, leach Cl



QUESTIONS?

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